

**PATENT APPLICATION**

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE  
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES**

In re application of

Docket No: Q80074

Eun-sung LEE, et al.

Appln. No.: 10/797,579

Group Art Unit: 1734

Confirmation No.: 4816

Examiner: Yewebdar T. TADESSE

Filed: March 11, 2004

For: SPIN COATING APPARATUS FOR COATING PHOTORESIST

**SUBMISSION OF APPEAL BRIEF**

**MAIL STOP APPEAL BRIEF - PATENTS**

Commissioner for Patents

P.O. Box 1450

Alexandria, VA 22313-1450

Sir:

Submitted herewith please find an Appeal Brief.

The statutory fee of \$500.00 is being paid via the USPTO Electronic Filing System (EFS). The USPTO is also directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,

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Date: June 8, 2007

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**APPEAL BRIEF UNDER 37 C.F.R. § 41.37**

**MAIL STOP APPEAL BRIEF - PATENTS**

Commissioner for Patents

P.O. Box 1450

Alexandria, VA 22313-1450

Sir:

In accordance with the provisions of 37 C.F.R. § 41.37, Appellant submits the following:

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**I. REAL PARTY IN INTEREST**

The real party in interest is SAMSUNG ELECTRONICS CO., LTD., by virtue of an assignment recorded by the Assignment Branch of the U.S. Patent and Trademark Office on July 26, 2004, at Reel 015609, Frame 0503.

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**II. RELATED APPEALS AND INTERFERENCES**

To the knowledge and belief of Appellant, the Assignee, and the undersigned, there are no other appeals or interferences before the Board of Appeals and Interferences that will directly affect or be affected by the Board's decision in the instant Appeal.

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**III. STATUS OF CLAIMS**

Claims 1, 2, 6, 7 and 9-13 are all the claims pending in the application and presently stand rejected. All of the pending claims are the subject of this appeal.

Claims 3-5 and 8 have been canceled.

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**IV. STATUS OF AMENDMENTS**

The Amendment under 37 C.F.R. § 1.116 filed on February 9, 2007 has not been entered.

The Appendix included with this Brief sets forth the claims involved in the appeal and reflects all of the claim amendments that have been entered by the Examiner. That is, the Appendix sets forth the claims as amended by the Amendment under 37 C.F.R. § 1.111 filed September 22, 2006.

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**V. SUMMARY OF THE CLAIMED SUBJECT MATTER**

Independent claims 2, 7, and 11 have been rejected. Each of these claims is directed to a spin coating apparatus for coating photoresist. In general, a spin coating apparatus coats photoresist by depositing photoresist on a wafer and rotating the wafer so that the photoresist is spread on the wafer.

***Claim 2***

Referring to the features of the *exemplary* embodiment shown in FIG. 3, the spin coating apparatus of claim 2 includes a nozzle 100 for depositing photoresist 160 onto the wafer 120 and a spin chuck 140. The spin chuck 140 includes a mount part 142 for mounting a wafer 120 thereon and an extended projection part 144. The extended projection part 144 facilitates formation of an edge-bead 162 on the extended projection part 144 rather than on the wafer 120.<sup>1</sup>

The extended projection part 44 of the spin chuck 140 has a height that is lower than that of the wafer 120 mounted on the mount part 142.<sup>2</sup> If the height of the extended projection part 144 were higher than that of the wafer 120, then the photoresist would gather in front of the extended projection part 144 and still form an edge-bead on the wafer 120.

***Claim 7***

Again referring to the features of the *exemplary* embodiment shown in FIG. 5, the spin coating apparatus of claim 7 includes the features of claim 2 discussed above and also includes a

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<sup>1</sup> See the Original Specification at page 5 at first line of paragraph [33]- page 6, last line of paragraph [35].

<sup>2</sup> See the Original Specification at pages 5, 6 at all lines of paragraph [35].

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gas exhaust part 260 disposed so that gas is exhausted from an edge of the wafer 120 in a turning direction of the wafer and a centrifugal direction upon rotation of the wafer 120.<sup>3</sup>

Moreover, claim 7 also recites that the extended projection part 144 surrounds and is in contact with a circumference of the wafer 120.<sup>4</sup>

***Claim 11***

Again referring to the *exemplary* embodiments, like claims 2 and 7, the spin coating apparatus of independent claim 11 includes a nozzle 100 for depositing photoresist onto the wafer 120 and a spin chuck 140. The spin chuck 140 includes a mount part 142 for mounting a wafer 120 thereon and an extended projection part 144 that surrounds and is in contact with a circumference of the wafer 120. The extended projection part 144 facilitates formation of an edge-bead 162 on the extended projection part 144 rather than on the wafer 120.<sup>5</sup>

In addition, referring to the features of the *exemplary* embodiment shown in FIG. 4, the spin coating apparatus of independent claim 11 includes a separation part that includes removable plugs 180a, 180b that are inserted through corresponding holes 150a, 150b in the spin chuck 140. The plugs 180a, 180b push against the bottom of the wafer 120 and separate the wafer 120 from the spin chuck 140.<sup>6</sup>

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<sup>3</sup> See the Original Specification at page 7 at lines 3-7 of paragraph [45].

<sup>4</sup> See the Original Specification at FIGS. 3 & 5.

<sup>5</sup> See the Original Specification at FIG. 3 & page 5 at first line of paragraph [33]- last line of page 6, paragraph [35].

<sup>6</sup> See the Original Specification at page 6 at all lines of paragraph [40].

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**VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL**

1. Whether claims 1, 2, 9 and 10 are anticipated under 35 U.S.C. § 102(e) by Konishi et al. (6,012,585).
2. Whether claims 6, 7, 12 and 13 are unpatentable under 35 U.S.C. § 103(a) over Konishi in view of Emami et al. (2003/0070695).
3. Whether Claims 1, 2, 9 and 10 are unpatentable under 35 U.S.C. § 103(a) over Kelly et al. (5,294,257) in view of Chu (5,857,127).
4. Whether claims 6, 7, 11, 12 and 13 are unpatentable under 35 U.S.C. § 103(a) over Kelly and Chu in view of Emami.

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**VII. ARGUMENT**

**1. Rejection of Claims 1, 2, 9, and 10 under 35 U.S.C. § 102(e) as being anticipated by Konishi et al. (6,012,585)**

Claim 2

With respect to independent claim 2, Applicant respectfully traverses this rejection at least because Konishi does not disclose all of the recitations of the claimed spin coating apparatus. For example, Konishi does not disclose the claimed spin coating apparatus including a spin chuck with *both* a mount part and an extended projection part.

Konishi discloses a liquid film formation apparatus including a tray section 30 with an embankment 33, a liquid receiving base 32 (which retains a developing solution 10), and a peripheral holding portion 31. A wafer W is supported by the peripheral holding portion 31.<sup>7</sup> Importantly, Konishi's liquid formation apparatus also includes a spin chuck 2 that spins the wafer.<sup>8</sup>

According to the rejection, the Examiner asserts that Konishi's liquid receiving base 32 corresponds to the recited "extended projection part of the spin chuck."<sup>9</sup> However, this feature of the tray section 30 cannot reasonably correspond to the recited spin chuck at least because the tray section 30 *does not spin*.

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<sup>7</sup> See Konishi at FIGS. 6, 7, & 5:57-63.

<sup>8</sup> See Konishi at FIGS. 6, 7, & 5:42-45.

<sup>9</sup> See Office Action dated December 12, 2007 at page 2.

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As shown in FIG. 14C of Konishi, during operation of Konishi's liquid film formation apparatus, the tray section 30 is lowered while only Konishi's *spin chuck 2* spins.<sup>10</sup> Thus, one of ordinary skill would not consider Konishi's tray section 30, which does not spin, to be a portion of the spin chuck.

Moreover, Konishi's spin chuck 2 does not include any feature that could reasonably be considered an "extended projection portion" that facilitates formation of an edge-bead thereon. That is, the spin chuck does not include any extended portion.<sup>11</sup>

Therefore, Applicant respectfully requests the Board of Patent Appeals and Interferences to reverse this rejection of independent claim 2.

Claims 1, 9, and 10

Applicant respectfully requests the Board of Patent Appeals and Interferences to reverse this rejection of dependent claims 1, 9, and 10 because of their dependency from independent claim 2.

**2. Rejection of claims 6, 7, 12 and 13 under 35 U.S.C. § 103(a) over Konishi in view of Emami et al. (2003/0070695)**

Claim 6

Applicant respectfully requests the Board of Patent Appeals and Interferences to reverse this rejection of dependent claim 6 because of its dependency from independent claim 2 and because Emami, which the Examiner cites as showing a gas exhaust, does not cure the deficiency in Konishi discussed above with respect to claim 2.

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<sup>10</sup> See Konishi at 8:30-38.

<sup>11</sup> See Konishi at, for example, FIG. 6.

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Claim 7

With respect to independent claim 7, Applicant respectfully traverses this rejection at least because claim 7 would not have been obvious to one of ordinary skill in view of the combination of Konishi and Emami. That is, there is no combination of Konishi and Emami that would meet every recitation of the claimed spin coating apparatus.

As discussed above with respect to claim 2, Konishi does not disclose the claimed spin coating apparatus including a spin chuck with both a mount part and an extended projection part. That is, features of Konishi's tray section 30 cannot reasonably correspond to the recited spin chuck at least because the tray section 30 *does not spin*.

Moreover, as also discussed above, Konishi's spin chuck 2 does not include any feature that could reasonably be considered an "extended projection portion" that facilitates formation of an edge-bead thereon. That is, as shown in FIG. 6, the spin chuck 2 does not include any extended portion.

In addition, Konishi's spin chuck 2 does not include any structure that surrounds a circumference of the wafer while being in contact with the circumference of the wafer mounted on the mount part. That is, as shown in FIG. 14C, the spin chuck 2 does not include any extended portion that surrounds the circumference of the wafer. Instead, the spin chuck 2 is much smaller than the wafer W.

Finally, Emami, which the Examiner cites as showing a gas exhaust, does not cure this deficiency in Konishi.

Therefore, Applicant respectfully requests the Board of Patent Appeals and Interferences to reverse this rejection of independent claim 7.

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Claim 12

Applicant also respectfully requests the Board of Patent Appeals and Interferences to reverse this rejection of dependent claim 12 at least because of its dependency from claim 6.

Claim 13

Moreover, Applicant respectfully requests the Board of Patent Appeals and Interferences to reverse this rejection of dependent claim 13 at least because of its dependency from claim 7.

**3. Rejection of claims 1, 2, 9 and 10 under 35 U.S.C. § 103(a) over Kelly et al. (5,294,257) in view of Chu (5,857,127)**

Claim 2

With respect to independent claim 2, Applicant respectfully traverses this rejection at least because claim 2 would not have been obvious to one of ordinary skill in view of the combination of Kelly and Chu. That is, there is no combination of Kelly and Chu that would meet every recitation of the claimed spin coating apparatus. For example, there is no combination of Kelly and Chu that would include an extended projection part for facilitating formation of an edge-bead thereon; wherein the extended projection part of the spin chuck has a height lower than that of the wafer mounted on the mount part.

Kelly discloses an edge making spin tool designed to prevent the formation of an edge bead of photoresist from forming at the edge of a substrate (which can be a semiconductor wafer) and to prevent material from wetting the edge and back of the substrate.<sup>12</sup> In Kelly's first embodiment, a substrate 11 is mounted on a vacuum chuck 13 to which is fixed a frame 15 with

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<sup>12</sup> See Kelly at 1:22-45.

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a height substantially planer with the top surface of the substrate 11.<sup>13</sup> An inflatable elastomer 17, with a height that is substantially planer with the top surface of the substrate 11, is provided between the frame 15 and the substrate 11.<sup>14</sup> The substrate 11 is held in place by a vacuum.<sup>15</sup>

In another embodiment of Kelly, instead of the frame 15 and elastomer 17, an elastomer ring 41 is used. The substrate 11 is provided on top of the elastomer ring 41 and a vacuum pulls the substrate 11 down, embedding the substrate 11 in the elastomer ring 41.<sup>16</sup> As shown in FIG. 3B, the top surface of the substrate 11 is substantially planer to the top surface of the elastomer ring 41.

In view of this disclosure, Applicant respectfully submits that Kelly does not disclose an elastomer having a height that is lower than that of the wafer. Instead, the height of Kelly's elastomer must be substantially the same as the height of the wafer.

Moreover, Applicant respectfully submits that Chu, which the Examiner relies on as showing a nozzle for depositing photoresist, does not cure this deficiency in Kelly.

***Capable of being lower than the wafer***

The Examiner acknowledges that Kelly does not disclose that the height of Kelly's elastomer 17, 41 is lower than that of Kelly's substrate 11 (wafer). However, it is the Examiner position that the elastomer 17, 41 of Kelly's spin tool is *capable of* having a height that is lower

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<sup>13</sup> See Kelly at FIGs. 1B & 2.

<sup>14</sup> See Kelly at 3:61-66

<sup>15</sup> See Kelly at 3:54-55.

<sup>16</sup> See Kelly at FIGs. 3A, 3B, 3:27-37.

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than that of the substrate 11 depending on the thickness of the substrate and the elasticity of the ring.<sup>17</sup>

Assuming *arguendo* that the recitation that “the extended projection part of the spin chuck has a height lower than that of the wafer” is a functional limitation,<sup>18</sup> Applicant respectfully submits that the elastomer 17, 41 of Kelly’s spin tool *is not capable of* having a height lower than that of Kelly’s substrate. Instead, each of the elastomers 17, 41 Kelly’s spin tool are specifically disclosed as being inflated to a height that is substantially planer with the top surface of the substrate in order to “form a substantially continuous surface to avoid the possibility of impede the flow of resist, polyimide, or other liquid coating material off the substrate as the substrate 11 spins.”<sup>19</sup> Therefore, Kelly uses an inflatable elastomer for the specific purpose of adjusting the height of the elastomer based on the height of the substrate 11.

Moreover, referring to FIGS. 3A and 3B of Kelly, when the wafer substrate 11 is disposed on an elastomer 41, an edge seal is provided by pulling the wafer substrate 11 down with a vacuum force into the elastomer 41 located along the edge of the wafer substrate 11. This seal prevents the photoresist or resist from being coated on the edge and back of the wafer substrate 11.<sup>20</sup>

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<sup>17</sup> See Office Action dated December 12, 2006, at page 4, lines 1-4.

<sup>18</sup> See MPEP § 2173.05(g) (“A functional limitation must be evaluated and considered, just like any other limitation of the claim, for what it fairly conveys to a person of ordinary skill in the pertinent art in the context in which it is used.”)

<sup>19</sup> See Kelly at 3:61-66.

<sup>20</sup> See Kelly at 5:21-25 & 1:39-41 (“The second problem is that the coating material often wets the wafer edge and creeps around the back of the wafer during spinning.”)

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Accordingly, unlike the coating apparatus of claims 2 and 7, Kelly's elastomer is not only used to prevent the formation of the edge bead on the substrate. Instead, the Kelly's elastomer also prevents the formation of resist coating on the edge and back of the substrate by effectively surrounding the circumference of the substrate.

Therefore, Kelly's elastomer should not be lower than the wafer substrate 11. Accordingly, Kelly's elastomer *is not capable of being lower than the wafer substrate 11* because, if the elastomer 17, 41 is lower than the substrate 11, then the elastomer 41 would not be able to prevent the resist from coating the edge of the substrate 11.

***Extended projection part having a height lower than that of the wafer***

Moreover, the recitation that "the extended projection part of the spin chuck has a height lower than that of the wafer mounted on the mount part" is not a functional limitation. That is, this recitation describes a *structural* relationship between the extended projection part and the inferentially included wafer, rather than any *function* provided by the projection part, such as "for facilitating formation of an edge-bead thereon."<sup>21</sup> Accordingly, in order to meet this limitation, the prior art references must be evaluated to determine whether they *actually* disclose this feature. However, as discussed above, the height of Kelly's elastomer is not lower than the wafer mounted on the mounted part, but is instead substantially the same as the height of the wafer.

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<sup>21</sup> See *Cross Medical Products Inc. v. Medtronics Sofamor Danek Inc.*, 424 F3d 1293, 76 USPQ2d 1662, 1671-72 (Fed. Cir. 2005) (The recitation "operatively joined" required a *structural* connection between the "lower bone interface" and the inferentially included "bone segment." That is, claim 5 at page 1667 only inferentially includes the "bone segment.")

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Accordingly, Applicant respectfully requests the Board of Patent Appeals and Interferences to reverse this rejection of independent claims and 7.

Claims 1, 9, and 10

Applicant respectfully requests the Board of Patent Appeals and Interferences to reverse this rejection of dependent claims 1, 9, and 10 because of their dependency from independent claim 2.

**4. Rejection of claims 6, 7, 11, 12 and 13 under 35 U.S.C. § 103(a) over Kelly and Chu in view of Emami**

Claim 6

Applicant respectfully requests the Board of Patent Appeals and Interferences to reverse this rejection of dependent claim 6 because of its dependency from independent claim 2 and because Chu, which the Examiner relies on as showing a nozzle for depositing photoresist, does not cure the deficiencies in Kelly.

Claim 7

With respect to independent claim 7, Applicant respectfully traverses this rejection at least because claim 7 would not have been obvious to one of ordinary skill in view of the combination of Kelly, Chu, and Emami. That is, there is no combination of Kelly, Chu, and Emami that would meet every recitation of the claimed spin coating apparatus.

As discussed above with respect to claim 2, Kelly does not disclose an the elastomer having a height that is lower than that of the wafer. Instead, the height of Kelly's elastomer must be substantially the same as the height of the wafer. In addition, as discussed above, Chu, which

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the Examiner relies on as showing a nozzle for depositing photoresist, does not cure this deficiency in Kelly.

Moreover, Emami, which the Examiner cites as showing a gas exhaust, does not cure this deficiency in Kelly.

Therefore, Applicant respectfully requests the Board of Patent Appeals and Interferences to reverse this rejection of independent claim 7.

Claim 11

With respect to independent claim 11, Applicant respectfully traverses this rejection at least because claim 11 would not have been obvious to one of ordinary skill in view of the combination of Kelly, Chu, and Emami. That is, there is no combination of Kelly, Chu, and Emami that would meet every recitation of the claimed spin coating apparatus.

The Examiner acknowledges that neither Kelly nor Chu discloses a spin coating apparatus in which the spin chuck includes removable plugs that are inserted through corresponding holes in the spin chuck to push against the bottom of the wafer and separate the wafer from the spin chuck. Therefore, the Examiner looks to Emami's apparatus for removing an edge bead from a substrate.

Emami discloses that the substrate can be lifted by a set of lift pins or a lift hoop disposed on a lift platform or a lift ring in or around the vacuum chick body.<sup>22</sup> However, Emami is deficient at least because it does not disclose that the lift pins are inserted through *corresponding holes* in the spin chuck. This recited feature is never referred to in Emami.

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<sup>22</sup> See Emami at page 3, paragraph [0028].

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Therefore, Applicant respectfully requests the Board of Patent Appeals and Interferences to reverse this rejection of independent claim 7.

Claim 12

Applicant also respectfully requests the Board of Patent Appeals and Interferences to reverse this rejection of dependent claim 12 at least because of its dependency from claim 6.

Claim 13

Moreover, Applicant respectfully requests the Board of Patent Appeals and Interferences to reverse this rejection of dependent claim 13 at least because of its dependency from claim 7.

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**VIII. CONCLUSION**

As noted in the concurrently filed Submission of Appeal Brief, the statutory fee of \$500.00 is being paid via the USPTO Electronic Filing System (EFS). The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

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Date: June 8, 2007

Attorney Docket No.: Q80074

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**CLAIMS APPENDIX**

**CLAIMS 1, 2, 6, 7 AND 9-13 ON APPEAL:**

1. The spin coating apparatus according to claim 2,

wherein the extended projection part of the spin chuck surrounds a circumference of the wafer while being in contact with the circumference of the wafer mounted on the mount part.
2. A spin coating apparatus for coating photoresist, comprising:

a spin chuck comprising a mount part, for mounting a wafer thereon, and an extended projection part for facilitating formation of an edge-bead thereon; and

a nozzle for depositing photoresist onto a wafer mounted on the mount part of the spin chuck;

wherein the extended projection part of the spin chuck has a height lower than that of the wafer mounted on the mount part.
6. The spin coating apparatus according to claim 2, which further comprises a gas exhaust part disposed so that gas is exhausted from an edge of the wafer in a turning direction of the wafer and a centrifugal direction upon rotation of the wafer.
7. A spin coating apparatus for coating photoresist, comprising:

a spin chuck for rotating a wafer;

a nozzle part for depositing photoresist onto the wafer mounted on the spin chuck; and

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a gas exhaust part disposed so that gas is exhausted from an edge of the wafer in a turning direction of the wafer and a centrifugal direction upon rotation of the wafer;

wherein the spin chuck comprises a mount part and an extended projection part, the extended projection part surrounding a circumference of the wafer while being in contact with the circumference of the wafer mounted on the mount part;

wherein the extended projection part of the spin chuck has a height lower than that of the wafer mounted on the mount part.

9. The spin coating apparatus according to claim 2, wherein the extended projection part of the spin chuck is physically attached to the mount part of the spin chuck.

10. The spin coating apparatus according to claim 2, wherein the entire circumference edge of the wafer is in contact with the extended projection part of the spin chuck.

11. A spin coating apparatus for coating photoresist, comprising:  
a spin chuck comprising a mount part, for mounting a wafer thereon, and an extended projection part for facilitating formation of an edge-bead thereon; and

a nozzle for depositing photoresist onto a wafer mounted on the mount part of the spin chuck;

wherein the spin chuck further comprises a separation part for separating the wafer from the spin chuck; and

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wherein the separation part comprises removable plugs that are inserted through corresponding holes in the spin chuck to push against the bottom of the wafer and separate the wafer from the spin chuck.

12. The spin coating apparatus according to claim 6, wherein the gas exhaust part is disposed above the wafer, and the gas is exhausted to remove an edge-bead.

13. The spin coating apparatus according to claim 7, wherein the gas exhaust part is disposed above the wafer, and the gas is exhausted to remove an edge-bead.

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**EVIDENCE APPENDIX:**

Pursuant to 37 C.F.R. § 41.37(c)(1)(ix), any evidence submitted pursuant to 37 C.F.R. §§ 1.130, 1.131, or 1.132 or any other evidence entered by the Examiner and relied upon by Appellant in the appeal.

**None.**

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**RELATED PROCEEDINGS APPENDIX**

Submitted herewith are copies of decisions rendered by a court or the Board in any proceeding identified about in Section II pursuant to 37 C.F.R. § 41.37(c)(1)(ii).

**None.**